

Evaluation of Coliphage as a Beach Water Quality Indicator in Southern California

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Presentation to the SCCWRP Commission

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COLIPHAGE

- **Viruses that infect E. coli and other coliforms**
 - Two main types
 - Somatic
 - Male-specific (F+)
- **Easy to enumerate**
- **Non-pathogenic to humans**
- **Consistently present in high numbers in human sewage**



EPA IS MOVING FORWARD TOWARD DEVELOPING COLIPHAGE CRITERIA FOR RECREATIONAL WATERS

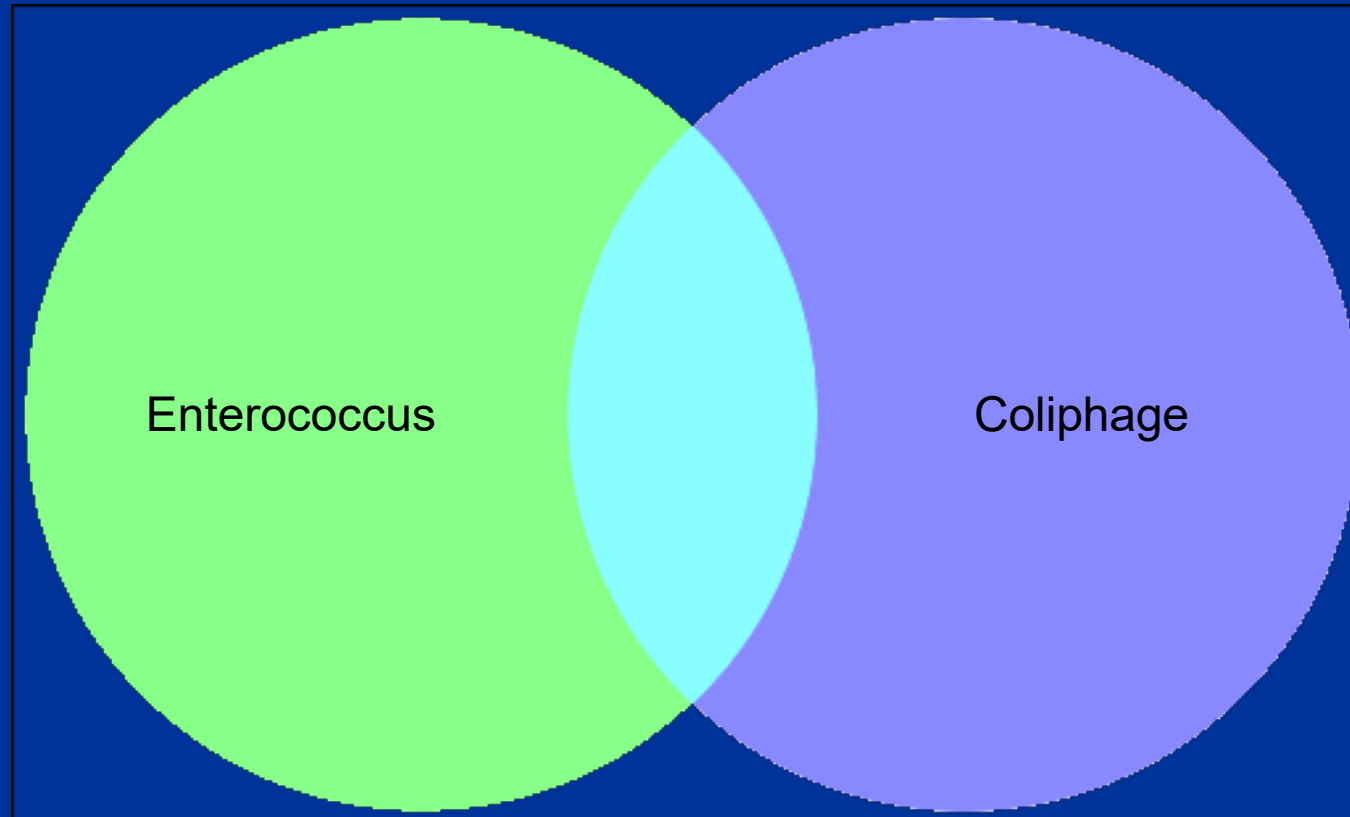
- **April, 2015 - EPA published *Review of Coliphages as Possible Viral Indicators for Fecal Contamination for Ambient Water Quality***
- **April, 2016 - Coliphages a focus at EPA Recreational Water Conference**
- **April, 2018 - EPA Method 1642: Male-Specific (F+) and Somatic Coliphage in Recreational Waters and Wastewater by Ultrafiltration**

WHY MEASURE COLIPHAGE?

- ***Enterococcus* is an imperfect indicator**
 - May be above action values when source of bacteria is non-fecal
 - May be below action values when viral pathogens still present
- **Need an indicator that mimics human viruses**
 - Viruses can survive treatment
 - Similar fate and transport in the environment
- **Coliphage is already approved for other applications**
 - EPA – Groundwater, Drinking water
 - FDA Shellfish bed monitoring

BIGHT 18' MICROBIOLOGY COMMITTEE

- Elected to examine how the new coliphage method performs at California beaches



BIGHT '18 MICROBIOLOGY STUDY

Phase 1: Train labs in EPA Method 1642

Phase 2: Intercalibration Exercise to make sure training stuck

Phase 3: Beach Water Testing

PHASE 1: TRAINING

- **Two-day hands-on training conducted at OCSD**
 - Ultrafiltration
 - Phage propagation and enumeration
 - QA/QC measures
- **Labs continued to practice method on their own for two weeks**
 - SCCWRP provided support and served as Help Desk

PARTICIPATING LABS

Orange County Sanitation District

Orange County Public Health Lab

City of Los Angeles

Los Angeles County Sanitation District

City of San Diego

County of Ventura (Cal State Channel Islands)

PHASE 2: LABORATORY INTERCALIBRATION

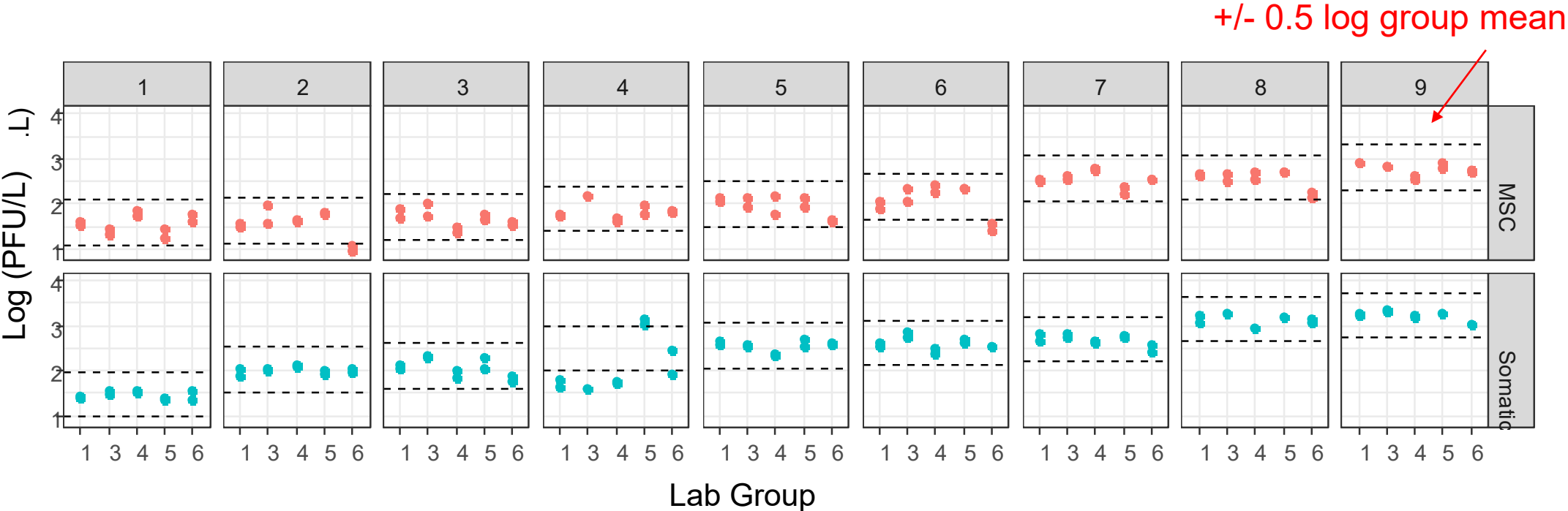
- **12 blind samples**
 - Clean phosphate-buffered saline (PBS) or seawater to test for matrix effects
- **Three sample types**
 - Spiked with male-specific and somatic coliphage
 - Spiked with sewage
 - Performance blanks
- **Samples processed in duplicate**

EVALUATING LAB PERFORMANCE

- **EPA Method Validation Criteria**
 - Percent coliphage recovered from spiked samples
 - Relative percent difference between duplicates

- **Repeatability**
 - Across lab
 - Within Lab

COLIPHAGE LEVELS FROM SPIKED WATER SAMPLES

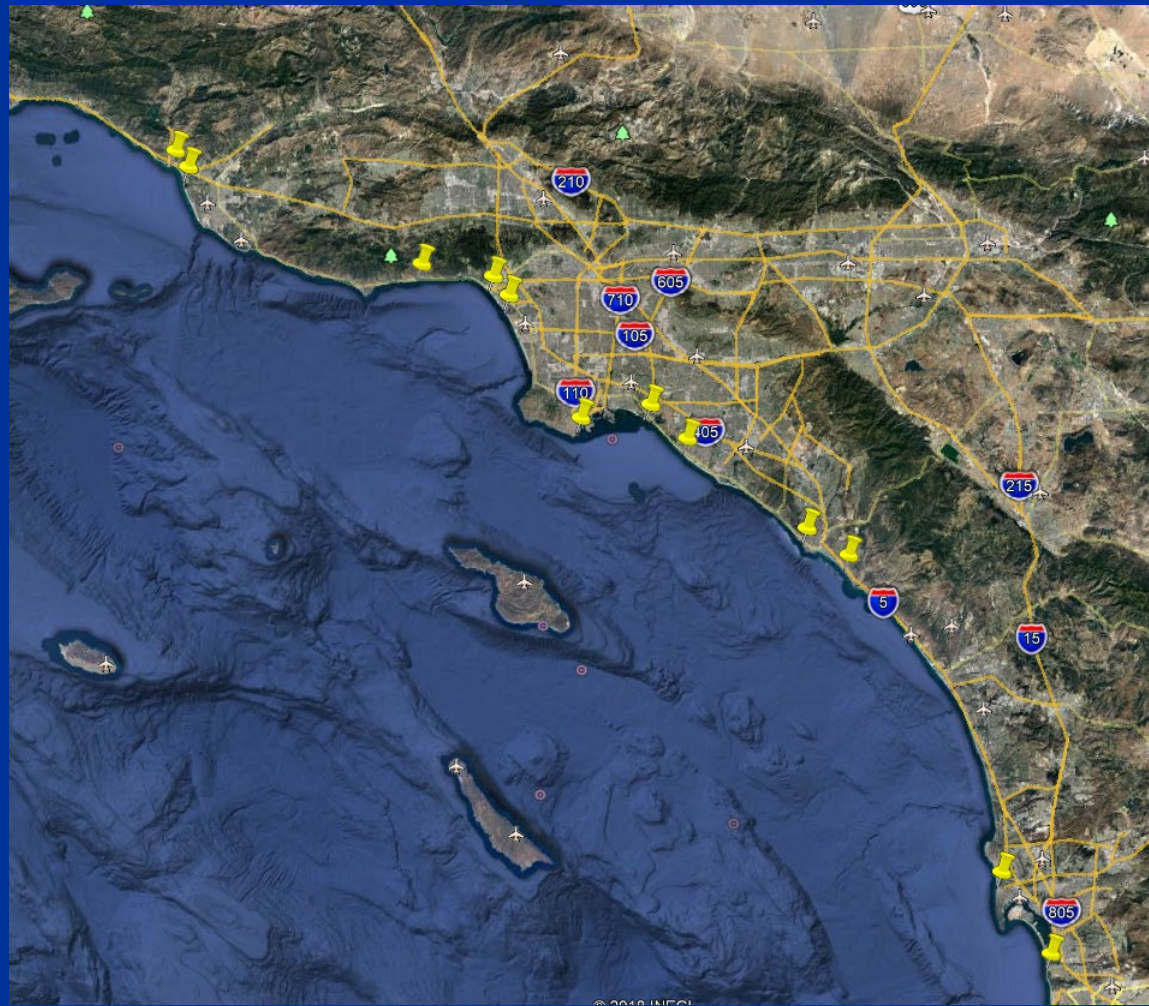


PHASE 3: BEACH WATER TESTING

- **12 beach sites**
- **Samples collected during routine monitoring**
 - 30 dry weather samples
 - 30 wet weather samples (desired)
- **Comparative testing for Enterococcus and coliphage**

BIGHT 18' COLIPHAGE SAMPLING SITES

Monitoring Agency	Location
County of Ventura	Surfer's Point at Seaside
County of Ventura	Surfer's Knoll Beach
City of Los Angeles	Surfrider Beach
City of Los Angeles	Santa Monica Pier
LACSD	Marina Del Rey
LACSD	Inner Cabrillo
OCSD	Huntington Beach Station 3N
OCSD	Huntington Beach Station Zero
OCPHL	Salt Creek
OCPHL	San Clement Pier
City of San Diego	Dog Beach
City of San Diego	Imperial Beach



WHAT'S NEXT

- **All laboratories cleared to process environmental samples**
- **Anticipate two or more wet seasons needed to collect desired number of wet weather samples**
- **SCCWRP will continue to support labs during study**